# Chapter 3

# Some Refractory Hypotheses of Economic Development

In the previous chapter, we set strict standards for that interesting and valuable subset of statements known as operational scientific hypotheses. Two steps are involved in formulating and testing such hypotheses; first, a causal link must be established between the premises and the observational inferences of the logical statement; second, the truth content of the statement must be examined by reference to the facts. It should not be surprising that strictly operational hypotheses are scarce in most fields of science, including economic development, since their requirements are exigent. On the other hand, nonoperational and partially operational hypotheses abound. These should not be dismissed lightly for at least three reasons. First, even nonoperational hypotheses may contain the germs of an important idea that could conceivably be developed into a testable proposition. Second, even incomplete hypotheses can contribute to the dialectic process of learning through which new hypotheses are born and old hypotheses die. Third, it is often the unfortunate blessing of nature that there is an inverse relationship between the importance and testability of hypotheses, the more important hypotheses being more difficult to test. As Braithwaite has pointed out, the difficulty of testing hypotheses may not necessarily be attributed to the lack of scientific rigor but rather to the way science progresses.

> . . . Science, as it advances, does not rest content with establishing simple generalizations from observable facts: it tries to explain these lowest-level generalizations by deducing them from more general hypotheses at a higher level. Such an organization of a science into a hierarchical deductive system requires the use of subtle deductive techniques, which are provided by pure mathe-

matics. As the hierarchy of hypotheses of increasing generality rises, the concepts with which the hypotheses are concerned cease to be properties of things which are directly observable, and instead become "theoretical" concepts—atoms, electrons, fields of force, genes, unconscious mental processes—which are connected to the observable facts by complicated logical relationships. (Braithwaite 1953, p. ix.)

This chapter is devoted to hypotheses that constitute higher level generalizations in the economics of development. Many such hypotheses emphasize noneconomic determinants of economic development. Since subsequent chapters are devoted largely to economic factors, this chapter presents a sampling of issues that would otherwise be entirely overlooked in our analysis. Another characteristic of some of the hypotheses presented in this chapter is that they are not fully operational on the basis of the criteria set out in Chapter 2. In such cases, we discuss (1) how these hypotheses have traditionally been stated; (2) what the difficulties that arise in testing them are; and (3) as far as possible how they can be reformulated to become operational. For this reason, this chapter can be considered an extension and an illustration of Chapter 2. These two characteristics—the comprehensiveness that extends to noneconomic factors and the nonoperational formulation—make the hypotheses of this chapter especially difficult to handle, that is, refractory.

As examples of incompletely operational hypotheses, we discuss two quite different approaches to stage theories (those of Rostow and of Adelman and Morris), attitudinal determination, status withdrawal, and a number of different "threshold" theories. Each illustrates a different type of shortcoming that renders empirical testing difficult or impossible.

In many fields of natural science, it has been found useful to distinguish the different stages through which organisms pass in their growth and evolution. For example, it is common and useful to distinguish a caterpillar from a cocoon from a moth. A successful stage theory must at least specify the various attributes of a caterpillar that are different from a cocoon and from a moth. However, it must do more than that: it must also specify unambiguously conditions under which the organism moves from one stage to another. In the case of the caterpillar, the kinds of foods the caterpillar must eat, the temperature it requires, and the time it takes to spin the cocoon would be among the conditions to be specified. If and only if the stages can be distinguished and the conditions for changing from one stage to another can be specified is it possible to make predictions from the theory. Finally, by applying a demarcation rule to observations in which the conditions are fulfilled, the theory can be tested.

The complex process of economic development has also been approached from the point of view of stage theory. In fact, there has been a long line of stage theorists who have gone about identifying the various stages of economic development in different ways. Some have defined stages in terms of population density, the progression of stages being manifested in the shifts from areas of lesser density to those of greater density. Others have defined stages in terms of the sectoral composition of economic activity and the progression of stages from those in which the primary sectors (agriculture and mining) are dominant to those in which the manufacturing and/or service sectors are dominant.[1]

We shall discuss two of the more recent and popular stage theories: Rostow's historical stage theory and the Adelman and Morris social-political-economic brand of stage theory. Since each utilizes different analytic techniques and is incompletely operational for different reasons, they can profitably be discussed separately.

## Rostow's Stage Theory

Rostow's stage theory[2] is designed not along the lines of a "rigid Newtonian derivation from a few axiomatic assumptions" but rather as a "kind of biological theory of process and pattern" (Rostow 1962). His theorizing is clearly motivated by what he considers the failure of economic theory. As a result, Rostow's theory is based on various observations taken from the histories of developed countries which, he feels, reveal a considerable degree of uniformity in the patterns and processes of development.

[1]For a presentation and analysis of stage theories of development, see Hoselitz (1960).
[2]The theory is most completely expressed in Rostow (1961, 1962).

Five stages are identified—"traditional society," "preconditions for takeoff," "takeoff into self-sustaining growth," "the drive to maturity," and "age of mass consumption"—through which every society would pass in achieving economic growth. Unfortunately, the distinctions drawn by Rostow between some of these stages, such as that between the traditional society stage and the preconditions for takeoff stage, are not sharp. For example, one characteristic of traditional society that is not a characteristic of the next stage is a "pre-Newtonian science and technology" and "pre-Newtonian attitudes to the physical world" (1961, p. 1). Since it is difficult to determine what kinds of science and attitudes are pre-Newtonian and which are not, it is possible to limit the analysis to three stages—pre-takeoff, takeoff, and post-takeoff —at virtually no cost in analytic power.

For each stage, Rostow specifies a number of distinguishing characteristics. The preconditions stage is characterized by a dramatic rise in agricultural productivity, political stability, heavy migration to the cities, substantial development of transportation and other forms of social overhead capital, and increasing capital goods imports financed by capital inflows as well as by raw material exports. The takeoff stage is characterized by a jump in the rate of productive investment from 5 percent or less to 10 percent or more of national income; the development of one or more substantial manufacturing sectors with a high growth rate; the existence or quick emergence of a political, social, and institutional framework ". . . which exploits the impulses to expansion in the modern sector and the potential external economy effects of the take-off and gives to growth an on-going character"; and a marked rise in the rate of growth of national income, aggregate and per capita (1962, p. 284). Furthermore, the time required for the takeoff period should be relatively short, no longer than 20 to 30 years. Finally, the post-takeoff stage is characterized by a shift of leading sectors, an eventual smoothing out of the growth rate, and less and less structural change.

Although some of these attributes of the different stages may not be operational, probably a sufficient number could be defined more precisely to permit at least a meaningful classification of particular countries. Unfortunately, as a result of qualifications he liberally intro-

duces, Rostow's schema does not even provide a satisfactory classificatory scheme. Even the various characteristics that in the earlier versions of his theory were stated as necessary conditions are later compromised considerably. For example, in reference to the preconditions stage, Rostow subsequently distinguishes between the general case (Europe) and the special case of the "born-free" countries (the United States, Australia, Canada, etc.). He also hedges on the necessity of capital imports (1962, p. 285) and on the jump in the investment rate (1962, p. 292). In contrast to his earlier emphasis on uniformity in the growth process, these later qualifications lead him to conclude: "Perhaps the most important thing to be said about the behavior of these variables in historical cases of take-off is that they have assumed many different forms. There is no single pattern" (1962, p. 292). It is no wonder that much of the discussion of Rostow's stage theory has been limited to discussions as to whether or not his particular designations for particular countries at specific points in time are "correct."

The building of a classificatory system does not, by itself, constitute stage theory. What is also needed is an explanation of how and why a country moves from one stage to another at a particular time. In that respect also, Rostow's efforts are incomplete and unsuccessful, and his facts are often incorrect. For example, he says that the necessary condition of a rise in agricultural productivity could come from land reform and the breakup of feudalism, but alternatively, it could be induced by a favorable trend in the terms of trade. Moreover, in the final analysis, the rise in agricultural productivity may not be necessary if the area under cultivation can be expanded easily. Similarly, in explaining the transition to takeoff, Rostow suggests that industrialization and takeoff may be induced by a favorable shift in the terms of trade resulting from the rise in agricultural productivity in the preconditions stage. However, capital imports, urbanization, education, entrepreneurship, the opening up of foreign markets, and numerous other factors provide alternative explanations.

The result of this ambivalence is that one can never formulate a demarcation rule for deciding whether or not a specific case lies within or without the acceptable bounds of one's model. By backing away from the original determinancy of the model (presumably

in an attempt to "save" the model), Rostow has rendered his theory nonoperational. Rostow attempts to defend his position by emphasizing the importance of stochastic elements, such as entrepreneurship and public policy, viewing his theory as a stochastic theory and as a "noncommunist manifesto," that is, a more realistic alternative to Marx's extremely deterministic (and powerful) theory of growth. As we suggested in Chapter 2, however, the fact that a statement is stochastic does not imply that a demarcation rule cannot be specified. Although the probabilistic element is relevant in determining the number of observations on the wrong side of the demarcation rule that one is willing to tolerate before rejecting the hypothesis, it does not obviate the need for a clearly stated demarcation rule. Lacking such a rule, Rostow's model, judged as a whole, is at best a classificatory scheme and at worst a series of entirely uninteresting existential statements of the form, for example, "there existed takeoffs that followed a rise in agricultural productivity." Since such existential statements can never be rejected, they do not lead to knowledge.

What could be done with his theory to make it more operational? We will suggest briefly how a central point of Rostow's theory could be reformulated. First, we would identify a country as being at the takeoff stage if, over a period of 20 to 30 years, that country is observed to: (1) achieve an increase in the annual rate of net investment from 5 percent or less of national income to 10 percent or more; (2) stabilize its population growth at 1.5 percent per annum or less; and (3) increase its allocation of investment to the capital goods industry. Second, we would state the theory as follows: if and only if a country satisfies all the characteristics of takeoff will it achieve an increase in the rate of growth of national income and national income per capita of at least 1 percent per annum sustained over a period of at least two decades. Finally, we could state a demarcation rule: if in more than 5 percent of the cases in which the conditions of takeoff are fulfilled, growth rates are not increased on a sustained basis by at least one percent per annum, the theory should be rejected.[3]

Kuznets (1963a) and Fishlow (1965b) have

summarized the statistical evidence available for a number of countries with respect to this version of Rostow's thesis. The findings are: (1) in a few of the cases in which sustained growth was subsequently obtained, the net investment rate had jumped by as much as 5 percent in the preceding 20 to 30 years and (2) in most of the cases in which the investment rate did rise by as much as 5 percent, the rise in the income growth rate was either less than 1 percent per annum or was temporarily higher but was not sustained. Clearly, the rise in the investment rate has proven to be neither a necessary nor a sufficient condition for sustained growth. This stricter version of Rostow's theory must therefore be rejected.

It is certainly possible to restate the theory in a weaker or more qualified manner to make it consistent with the evidence. As we have pointed out, however, weaker formulations run the risk of becoming nonoperational. Even if a more operational version of Rostow's stage theory had been confirmed with respect to the available economic histories of DCs, additional questions could be raised about the validity of such results for contemporary LDCs.

## Social, Political, and Economic Stage Theory

Adelman and Morris and their associates share with Rostow and others the view that the process of economic development can best be analyzed in terms of stages. They use different techniques in distinguishing these stages, explaining growth within each stage, and identifying the factors that determine the transition from one stage to another. By dealing with political, social, and cultural factors as well as with economic ones, and by focusing on the experience of LDCs, Adelman and Morris have simultaneously extended the scope of analysis of the development process and molded a stage theory that has more assured relevance to contemporary countries. By prodigious effort, they manage to quantify all these factors, including the noneconomic ones, and they provide empirical results that underscore the importance of noneconomic factors in explaining growth within and between different stages of development. Without going into detail, we will briefly review some of their prolific writings, to give at least an intuitive understanding of some of their meth-

[3]For other but somewhat similar formulations of the Rostow model, see Bićanić (1962), Peterson (1965), Thweatt (1968), and especially Kuznets (1963a).

ods, summarize their results, and illustrate some methodological problems that confront their interesting but refractory hypotheses.

Adelman and Morris use a variety of statistical techniques, including factor analysis, discriminant analysis, canonical correlations, and analysis of hierarchical interactions.[4] These techniques represent different forms of multivariate analysis. The basic difference between univariate and multivariate analysis is that while in the former we study the characteristics of the distributions of a scalar variable, in the latter we study the characteristics of the distribution of a vector of variables that are jointly dependent. For example, in univariate analysis we study the total consumption as a function of family income and family size. In multivariate analysis, on the other hand, we study the demand of each one of $n$ commodities as a function of the family income and the $n$ prices of the commodities.[5] Both relationships can be fitted with $m$ observations of family survey data.

The early applications of Adelman and Morris used factor analysis, upon which their subsequent studies also rely. We shall, therefore, present a brief and intuitive exposition of this form of multivariate analysis.[6]

## Factor Analysis

Not unlike regression analysis, factor analysis is basically an analysis of variance technique. It decomposes the variance of a variable into several components based on its association with other variables. Unlike regression analysis, however, these other variables are not

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[4]The analysis of hierarchial interactions that refers to the study of income distribution is presented in Chapter 14.

[5]As an example of this application of multivariate analysis, see the Stone (1954) linear logarithmic demand function:

$$q_k = \alpha_k \mu^{\beta_{k0}} \prod_j p_j^{-w_j \beta_{k0} + \beta_{kj}}$$

where

$q_k$ = quantity of commodity $k$, $k = 1$ to $n$, consumed by a family
$p_j$ = price of commodity $j$, $j = 1$ to $n$
$\mu = \Sigma p_j q_j$, that is, the income of the household
$w_j = \frac{p_j q_j}{\mu}$, that is, the weight of commodity $j$ in the total budget.

In this system, the coefficient $\beta_{k0}$ describes the income effect, $-w_j \beta_{k0}$ the indirect effect of price on income, and $\beta_{kj}$ the substitution effect.

[6]For the technical presentation of the method, the reader is referred to Adelman and Morris (1967), Harmon (1960), Thurstone (1961), and Horst (1965).

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observable. Instead, they are hypothetical or latent variables, called factors, consisting of clusters of the original variables.

The factor analysis problem can be expressed in matrix form. Suppose we have data for $m$ countries consisting of $n$ indicators, such as GNP per capita, level of education, and so on. We can denote the decomposition of the variance of each indicator as

$$\mathbf{x} = \begin{pmatrix} x_1 \\ \vdots \\ x_n \end{pmatrix} = \mathbf{A} + \mathbf{Bf} + \mathbf{u}$$

where $\mathbf{x}$ is a column vector of $n$ indicators, $\mathbf{A}$ is a vector of $1 \times n$, $\mathbf{B}$ is a matrix of $n \times q$, $\mathbf{f}$ is a vector of $q \times 1$, and $\mathbf{u}$ is a vector of $n \times 1$.

In matrix form for $m$ countries, we write

$$\mathbf{X} = \mathbf{A} + \mathbf{BF} + \mathbf{U}$$

where $\mathbf{X}$ is a $m \times n$ matrix, with elements the observable indicators for each country. The elements of the vector $\mathbf{F}$ are the latent variables, the factors. $\mathbf{B}$ then consists of the coefficients of these factors, called factor loadings. The major aim of factor analysis is to determine the factor loadings, that is, the coefficients that relate the observed variables to the common factors. Factor loadings play the same role in factor analysis as regression coefficients in regression analysis. The squared factor loadings represent the relative contribution of each factor to the standardized variance of each indicator, $x_i$. If a given factor, $f_i$, appears only in a subset of the elements of $\mathbf{X}$, it is called a *group factor*. It is possible, however, that a factor $f_i$ appears in all the elements of $\mathbf{X}$. Then it is called a *common factor*, and the *commonality* for each variable is represented by the sum of the squares of its factor loadings. The commonality indicates the extent to which the common factors account for the total unit variance of the variable $x_i$. It is akin to the coefficient of multiple determination in regression analysis, the $R^2$. Besides the common factors and the group factors, we may also have a *specific factor*, one that appears only in the element $x_i$. This appears in the residual $u$, which also includes errors in measurement and noise in the universe.

Factor analysis is primarily helpful to organize and simplify complex statistical data. While it may be possible in our example to fully describe each of the $m$ countries in terms

of the whole array of the $n$ indicators, it is more economical to do so by first arranging (or reducing) clusters of indicators in a small number of factors that can be interpreted intuitively, and then utilizing the smaller number of factors to describe or classify the countries. This is what factor analysis does, making for a somewhat different relationship between variables than in regression analysis. While in regression analysis the independent variables are by hypothesis uncorrelated, in factor analysis the variables, the factors, are interdependent. Thus, while regression analysis may make it possible to identify causality and dependence, factor analysis may be thought of as identifying only interdependence (Adelman and Morris 1971, p. 94). Another problem that arises in factor analysis but not in regression analysis is that the factor loading matrix, $B$, is not estimable as such. Instead, one can estimate only the product of $B$ and its inverse, $BB^{-1}$. "Factor rotation" is a procedure for decomposing $BB^{-1}$ into its two components and thus involves principal component analysis.[7]

## Application of Factor Analysis to the Identification of Stages

As we have seen, the first step in stage theory is to classify, that is, to define the characteristics of a stage and to identify countries with respect to particular stages. With reference to a sample of 74 LDCs, Adelman and Morris heuristically obtain quantitative or semiquantitative data for each of 41 different social, political, and economic indicators of development. Some of these development indicators are traditional, such as per capita GNP, but some (especially the social and political ones) are distinctly nontraditional (e.g., "character of agricultural organization," "extent of leadership commitment to economic development," "degree of modernization of outlook," "extent of social mobility," and "character of basic social organization").

The complete list of 41 indicators appears

in Table 3.1 and distinguishes three groups: sociocultural, political, and economic.

Some of these indicators are, in turn, based upon two or more subindicators. For example, indicator 6, "extent of social mobility," is measured by: (1) "the ratio of the population five to nineteen years of age that is enrolled in primary and secondary schools"; (2) "the importance of the indigenous middle class"; and (3) "the presence or absence of prohibitive cultural or ethnic barriers to upward social mobility." As the authors admit, many of the other indicators are also based on a variety of qualitative characteristics that have been distinguished implicitly in the minds of the "experts" interviewed, not explicitly.

After defining the indicators and subindicators, Adelman and Morris resourcefully assign each of 74 LDCs a letter grade with respect to each indicator.[8] Finally, the letter-grade scales for these indicators, many of which are only qualitative, are converted to a numerical scale. The resulting "ordinal" scores are the basic data for their application of factor analysis and for their subsequent extensions of that analysis with other tools of multivariate analysis.

The first application of the technique is to interactions of the social and political indicators in the process of economic development (Adelman and Morris 1965, 1967). For this purpose, all the economic indicators given in Table 3.1 except one, per capita GNP, are omitted, and even this indicator is kept separate from the four factors into which the social and political indicators are clustered. The results appear in Table 3.2. Factor 1 ($F_1$ in the table) refers broadly to the extent of social differentiation and integration, that is, "processes of change in attitudes and institutions associated with the breakdown of traditional social organization." Factor 2 ($F_2$) is associated with political systems, indicating the transition from "centralized authoritarian political forms to specialized political mechanisms capable of representing the varied group interests of a society and of aggregating these interests through participant national political organs." Factor 3 ($F_3$) relates to leadership, "the strength of industrializing elites relative to traditional elites." Factor 4 ($F_4$) refers to social and political stability.

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[7]Referring to the previous notation for the factor analysis problem, we can specify the distributions of $f$ and $u$, respectively, as $f \sim N(0, I)$ and $u \sim N(0, \Sigma)$, where $\Sigma$ is the variance-covariance matrix. Then, since we have introduced a vector of constants, $A$, we can specify $E(f) = 0$. Similarly, since the elements of $B$ are completely unspecified, we can assume that the variances of the elements of $f$ are all equal. Given the observations on $x$, we can only estimate $\phi = BB^{-1} + \Sigma$. If $\Sigma$ were known, identifying the elements of $B$ in this context would be equivalent to the problem of decomposing a positive semidefinite matrix (Dhrymes 1970, pp. 77–82).

[8]Where subindicators enter the definition of an indicator, the letter grade is assigned after an implicit weight is attached to each subindicator.

**Table 3.1**  *Indicators of Social, Political, and Economic Structure Utilized by Adelman and Morris*

| Sociocultural Indicators | Political Indicators | Economic Indicators |
|---|---|---|
| 1. Size of the Traditional Agricultural Sector | 13. Degree of National Integration and Sense of National Unity | 25. Per Capita GNP in 1961 |
| 2. Extent of Dualism | 14. Extent of Centralization of Political Power | 26. Rate of Growth of Real per Capita GNP |
| 3. Extent of Urbanization | 15. Strength of Democratic Institutions | 27. Abundance of Natural Resources |
| 4. Character of Basic Social Organization | 16. Degree of Freedom of Political Opposition and Press | 28. Gross Investment Rate |
| 5. Importance of the Indigenous Middle Class | 17. Degree of Competitiveness of Political Parties | 29. Level of Modernization of Industry |
| 6. Extent of Social Mobility | 18. Predominant Basis of the Political Party System | 30. Change in Degree of Industrialization |
| 7. Extent of Literacy | 19. Strength of the Labor Movement | 31. Character of Agricultural Organization |
| 8. Extent of Mass Communication | 20. Political Strength of the Traditional Elite | 32. Level of Modernization of Techniques in Agriculture |
| 9. Degree of Cultural and Ethnic Homogeneity | 21. Political Strength of the Military | 33. Degree of Improvement in Agricultural Productivity |
| 10. Degree of Social Tension | 22. Degree of Administrative Efficiency | 34. Adequacy of Physical Overhead Capital |
| 11. Crude Fertility Rate | 23. Extent of Leadership Commitment to Economic Development | 36. Effectiveness of the Tax System |
| 12. Degree of Modernization of Outlook | 24. Extent of Political Stability | 37. Improvement in the Tax System |
| | | 38. Effectiveness of Financial Institutions |
| | | 39. Improvement in Financial Institutions |
| | | 40. Rate of Improvement in Human Resources |
| | | 41. Structure of Foreign Trade |

*Source:* Adelman, I. and C. T. Morris (1967), *Society, Politics, and Economic Development.* Baltimore: Johns Hopkins University Press, pp. 16–17.

The square of the rotated factor loadings represents the proportion of the variance in an indicator that is explained by a particular factor, after allowing for the contributions of the other factors. Thus, a factor 1 loading of 0.89 for the size of traditional agricultural sector implies that about 81 percent of the variance of this indicator is attributed to factor 1, that is, to social differentiation and integration. This is the usual interpretation of factor analysis. Adelman and Morris, however, go one step farther. The per capita GNP indicator was not included with any of the other indicators in any single factor, but was included in the factor analysis, and thus there are factor loadings for it with regard to each of the four factors. These factor loadings are used in a rather controversial way (from the technical point of view) to draw generaliza-

tions about the relationship between the per capita income and the four factors (Rayner 1970; Adelman and Morris 1970). The factor loadings for the per capita GNP are −0.73 for factor 1, 0.31 for factor 2, −0.26 for factor 3, and −0.03 for factor 4.[9] Since the squares of the factor loadings indicate the percent of the variance in the variable "explained by" or associated with each of the factors, Adelman and Morris claim that 53 percent of the intercountry variation in per capita GNP in 1961 is explained by factor 1, an additional 10 percent by factor 2, another 7 percent by factor 3, and about one-tenth of

[9]The reader might want to compare the rotated factor loadings of Adelman and Morris (1967), upon which the above discussion is based, with those of (1965). The difference in both weights and signs of the indicators illustrates the earlier point about the arbitrary nature of the factor matrix inversion.

1 percent by factor 4. The sum of the squared factor loadings, in the case of GNP per capita 70 percent, is the "commonality" of each indicator, and it represents the proportion of the total variance that is "explained" by the four factors taken together. The finding that 70 percent of the variance in GNP per capita is "attributed" to the sociopolitical indicators grouped in the four factors leads Adelman and Morris (1967, p. 150) to conclude that ". . . it is just as reasonable to look at underdevelopment as a social and political phenomenon as it is to analyze it in terms of intercountry differences in economic structure." A further interpretation of the rotated factor loadings is given. The loading of −0.73 of GNP per capita for factor 1 and the 0.89

for the size of the traditional agricultural sector included in factor 1 implies that GNP per capita is inversely related to the size of the traditional sector, and so on for the other rotated factor loadings.

The authors proceed with further applications of factor analysis to the same set of data for 74 LDCs. Since factor 1 is both the most important factor and constitutes a much broader index of development than other conventional measures, each country is then scored relative to factor 1 (Adelman and Morris 1965, 1967). These factor scores are used in turn to divide the sample of countries into three groups, identified as different *stages* of development—the "lowest," "intermediate," and "highest" stages. Separate factor analyses

**Table 3.2** *Rotated Factor Matrix for Per Capita Gross National Product Together with 24 Social and Political Variables*

| Political and Social Indicators | Rotated Factor Loadings | | | | Commonality |
|---|---|---|---|---|---|
| | $F_1$ | $F_2$ | $F_3$ | $F_4$ | |
| Per Capital GNP in 1961 | −0.73 | 0.31 | −0.26 | −0.03 | 0.699 |
| Size of the Traditional Agricultural Sector | 0.89 | −0.21 | 0.17 | −0.08 | 0.869 |
| Extent of Dualism | −0.84 | 0.14 | −0.30 | 0.04 | 0.824 |
| Extent of Urbanization | −0.84 | 0.13 | −0.12 | 0.02 | 0.741 |
| Character of Basic Social Organization | −0.83 | 0.24 | 0.10 | 0.03 | 0.761 |
| Importance of the Indigenous Middle Class | −0.82 | 0.14 | −0.23 | −0.08 | 0.755 |
| Extent of Social Mobility | −0.86 | 0.21 | −0.18 | −0.18 | 0.848 |
| Extent of Literacy | −0.86 | 0.32 | 0.03 | −0.11 | 0.845 |
| Extent of Mass Communication | −0.88 | 0.28 | −0.06 | −0.02 | 0.858 |
| Degree of Cultural and Ethnic Homogeneity | −0.66 | −0.30 | 0.34 | −0.21 | 0.680 |
| Degree of National Integration and Sense of National Unity | −0.87 | −0.07 | 0.01 | −0.18 | 0.792 |
| Crude Fertility Rate | 0.63 | −0.14 | 0.05 | 0.18 | 0.448 |
| Degree of Modernization of Outlook | −0.75 | 0.31 | −0.39 | −0.03 | 0.805 |
| Strength of Democratic Institutions | −0.48 | 0.72 | −0.26 | −0.19 | 0.857 |
| Degree of Freedom of Political Opposition and Press | −0.33 | 0.82 | −0.02 | −0.10 | 0.802 |
| Degree of Competitiveness of Political Parties | −0.32 | 0.79 | 0.08 | 0.25 | 0.801 |
| Predominant Basis of the Political Party System | −0.43 | 0.70 | 0.04 | 0.01 | 0.681 |
| Strength of the Labor Movement | −0.38 | 0.63 | −0.36 | −0.05 | 0.678 |
| Political Strength of the Military | −0.26 | −0.58 | 0.36 | 0.41 | 0.706 |
| Extent of Centralization of Political Power | −0.07 | −0.65 | 0.08 | −0.02 | 0.432 |
| Political Strength of the Traditional Elite | 0.08 | −0.07 | 0.73 | 0.05 | 0.543 |
| Extent of Leadership Commitment to Economic Development | −0.14 | −0.02 | −0.80 | −0.21 | 0.699 |
| Degree of Administrative Efficiency | −0.39 | 0.37 | −0.59 | −0.16 | 0.663 |
| Degree of Social Tension | 0.22 | 0.02 | 0.02 | 0.87 | 0.816 |
| Extent of Political Stability | −0.07 | 0.05 | −0.39 | −0.82 | 0.821 |

*Note:* The figures in the boxes indicate the factor to which each variable is assigned. Percentage of overall variance explained by factors: 73.7. Percentage of variance explained by last factor included: 5.0.

*Source:* Adelman, I. and C. T. Morris (1967), *Society, Politics, and Economic Development.* Baltimore: Johns Hopkins University Press, p. 151.

are then computed for three different sets of countries, that is, regional subsamples for Africa, Asia, and Latin America, with the same set of indicators. Since the three different regions correspond at least roughly to different stages of development, the authors find that the characterization of the factors varies somewhat from stage to stage, social factors dominating intragroup differences in per capita GNP in the "lowest" group (Africa) and political factors playing the dominant role in explaining such differences at later stages. These results would seem to confirm the meaningfulness of the factor analytic classification system adopted by Adelman and Morris, and defend the logic of a stage theory approach.

In another application of factor analysis, Adelman and Morris (1967) investigate the interactions of social, political, and economic factors using all indicators in Table 3.1 (including the economic factors). This analysis is applied separately to each of the three different stages identified on the basis of the country scores with respect to factor 1. In these cases, the rate of growth (1950–1964) instead of the level of per capita income is the dependent variable. The results, which are interpreted as short-run effects, are in general akin to those of the previous applications. For the countries at the lowest end of the socioeconomic scale, the growth process requires both economic and social transformation. For the countries at an intermediate level of development, the statistical results are rather inconclusive, with some evidence that the crucial economic influences are those governing the process of industrialization. Finally, the political preconditions for development are important in the countries at the high end of the socioeconomic scale. The crucial correlates of economic performance in these countries are the effectiveness of economic institutions and the extent of national mobilization for development.

## Further Applications of Multivariate Analysis

In subsequent studies using other multivariate techniques, Adelman, Morris, and their associates have gone on to produce other results which, they argue, support their thesis of the relative importance of social and political factors in development.

For instance, in Adelman and Morris (1968a), the technique of discriminant analy-

sis has been utilized to identify the specific indicators that best "predict" the development performance potential of individual countries or, in the language of the technique, best discriminate among different development performance groups. Their results indicate that four indicators (39, 35, 12, and 23 in Table 3.1 by order of importance) account for more than 99 percent of the discriminable variance among the different development performance groups.

Subsequently, Adelman and Morris (1968b) attempted to explain each of the four indicators identified in their discriminant analysis in terms of the remaining indicators by utilizing the technique of stepwise regression. In this way, for each of the four indicators, they identified and obtained regression coefficients for a small number of the initial indicators that would explain the preponderance of the intercountry variation in that indicator. Going further, they tried to explain the intercountry variation in each important determinant of the indicators in the discriminant function, and then that of the determinants in terms of other indicators iteratively, until all indicators that entered the model and could be explained satisfactorily were explained. The variables that could not be explained were identified as exogenous variables, for which multipliers expressing their effect on all endogenous variables could be calculated. In this way, they arrived at a fairly large-scale quantitative social-political-economic model of development. The variables with the highest multipliers on development performance were variables 39, 12, and 2.

In still another study, Adelman, Geier, and Morris (1969) applied the technique of "canonical correlation" to estimate the relationship between one endogenously chosen set of variables, identified as "instruments," and another set, identified as "goals." By this technique, they obtain some interesting estimates of: (1) the degree of inconsistency among the various goals; (2) the relative importance of the instruments in achieving the respective goals; and (3) the relative sensitivity of different kinds of goal satisfaction to the manipulation of various "policy instruments."

## Critique of Adelman and Morris

The scope and complexity of the work that Adelman, Morris, and their associates have

carried out are indeed stupendous. The data collection task for their work is of staggering magnitude. Deriving such indicators as "character of basic social organization" or "importance of indigenous middle class" might appear to be a futile exercise, not unlike defining Rostow's "pre-Newtonian science and technology." Yet through a heroic effort, Adelman and Morris have managed to obtain at least quasi-quantitative estimates for these indicators for an impressive sample of countries. Moreover, their attempt to broaden the analysis and scope of the study of economic development by treating social and political variables operationally is imaginative. Given the scope of such research, it should come as no surprise that one can question the validity and accuracy of some of their measurements, disagree with some of their judgments, and criticize some of their interpretations and conclusions. Some such questions and criticisms may be minor. Some, however, may compromise the validity of the results to a considerable degree.

Let us discuss the data problems first. Some indicators are based, at least partially, on the same subindicators, and thus may have introduced some spurious correlation among the variables. This is especially true with respect to the twelve social indicators associated with factor 1 in the original factor analysis, the results of which were presented in Table 3.2. As a result, spurious correlation among the variables of factor 1 may contribute significantly to the high factor loadings reported for these variables in Adelman and Morris (1967), the large multipliers for these variables reported in Adelman and Morris (1968b), and the heavy emphasis on social variables in the broadly defined index of development in Adelman and Morris (1965, 1967).

Another set of problems arises as a result of the ordinal measurement of the indicators included in the analysis (Brookins 1970; Adelman and Morris 1970). Ordinal variables are inappropriate for deriving "elasticities" and "multipliers" that are subject to the usual interpretation. Moreover, ordinal variables have no average, and hence one should properly use majority rule as a means of making classifications, but with the accompanying problems of intransitivity of rankings that Arrow (1951) has demonstrated. Lastly, when at least one of the series is strictly ordinal,

the appropriate measure of correlation is the Spearman rank-correlation coefficient instead of the simple correlation coefficient Adelman and Morris use as the basis for their analysis.

Many of the assumptions made at various points in the analysis are arbitrary, and some are quite unjustified. Procedures such as stepwise regression and factor analysis inevitably involve certain arbitrary judgments, such as how to draw the line between one factor and another or what variables to start with in deciding which and how many variables to add. The results are often quite sensitive to such arbitrary choices. For example, in their attempt to define a more satisfactory and comprehensive index of development, Adelman and Morris (1965; 1967, Table IV–1) did not include any economic indicators (except GNP per capita), even though these indicators were included in the subsequent "short-run" analysis (Adelman and Morris 1967, Tables V–1, VI–1, VII–1). We have released the arbitrary assumption that economic variables do not matter in the long-run analysis and have rerun the first "long-run" factor analysis with the economic variables included. Our results indicate that most of the economic variables (e.g., indicators 28, 29, 32, 34, 36, 38, 40) also associate with factor 1. Similarly, we have found that the results change if one allows the GNP per capita indicator to be included in factor 1, which seems reasonable, since it is included in the factor analysis. The decision to include or exclude variables is defensible on grounds of a priori knowledge, but such information is inadmissible in multivariate analysis (as we will demonstrate). Thus, the authors seem to make their decisions about what indicators or subindicators to include or exclude simply on the basis of whether or not they work out well.[10] This, of course, makes the results tautological.

While Adelman and her associates cannot be criticized for the ultraempiricist spirit in their work, they should have been more consistent in recognizing its limitations and in avoiding confusion between hypothesis formulation and testing. By the authors' own admission, no explicit theoretical statements are made:

[10]Some examples of this are the exclusion of "openness of access to political leadership" (1967, p. 34), "achievement motivation," and "social attitudes toward economic activity" (1967, p. 16).

The philosophy underlying the procedure used for constructing the model is quite overtly empiricist. Since there are no firmly validated theories of the process of socio-economic and political change, we consciously avoided *a priori* specification of the functions we wished to fit. Instead, we let the data specify the model. (Adelman and Morris 1968*b*, p. 1184.)

This, in general, multivariate analysis can do well. It "hunts for correlations," and it exposes possible interactions among the variables. Correlations are instructive in the process of constructing hypotheses through inductive reasoning. Without any specific theoretical underpinning, however, the transition from correlation to causality is impossible.

In view of this limitation, factor analysis (as well as discriminant analysis and canonical correlation) can serve three distinct purposes (Rayner 1970): it can be a ranking device, a descriptive device, or a tool for further analysis, for example, in suggesting new hypotheses. In each of these respects, it can be particularly useful when large numbers of variables, which for the sake of efficiency can be reduced to a smaller number of factors, are involved.

At times, however, the Adelman and Morris studies go beyond these legitimate uses of their techniques by relapsing into the habit of interpreting the associations established as indicating causality or indicating that certain conditions must be satisfied in order to achieve development. For example:

> The analysis in this chapter makes it clear that at the lowest end of the socioeconomic scale the nature of the growth process *requires* both economic and social transformation. It is apparent that for this group of countries the extent to which the sway of tribal society has been reduced and the degree to which the modernization of social structure has proceeded are important *determinants* of the rate of improvement of purely • economic performance. These social transformations are *required* for the enlargement of the sphere within which economic activity operates independently of traditional social organization. (Adelman and Morris 1967, p. 202, italics added.)

A more appropriate interpretation of the work of Adelman and Morris is that by classifying complex data and reading the correlations in the data they have formulated specific hypotheses.

One such hypothesis would be that four factors (the extent of social differentiation and integration, the political transformation from authoritarian regimes to representative governments, the quality of leadership, and the extent of social and political stability) account for the variance observed in a number of sociocultural and political indicators from a large sample of LDCs. Another hypothesis would be that the relative importance of the factors varies from stage to stage, with social factors being more important in the early stages, political and economic factors in the later stages.

However, Adelman and Morris cannot validly use the same set of data and interpret their correlations as evidence that their hypotheses are correct. A new set of data, independent evidence, and methods with greater emphasis on determinacy and causality and less on correlation would be required for this purpose. The lesson of this example is clear: for testing such hypotheses, one is much better off formulating the theory on a priori considerations (as difficult as this might be) before one lets the data "speak."

## From the Scylla of Uniformity to the Charybdis of Uniqueness: Motivational and Threshold Theories

In addition to noting their common as well as distinct shortcomings, which prevent them from being fully operational theories of development, our lengthy discussion of the Rostow and Adelman-Morris approaches has illustrated an important feature that permeates much of the literature: the search for sweeping similarities or uniformities in development patterns. As we have seen, these similarities, once discovered, tend to be elevated to the status of "preconditions" or "necessary requisites" for development, but usually at the risk of being wrong.

At the other extreme is the approach to development that places ultimate importance on the unique event, the random element, or the accidental factor. If uniformity is a Procrustean bed that presents the danger of emasculating the study of development, uniqueness pursued to the extreme may either negate the need for the study of development or at least

make such study operationally impossible. In the following paragraphs, we discuss briefly the theories on historical accidents, development-oriented tastes and attitudes, and thresholds that illustrate this limitation to varying degrees.

### Historical Comparisons

Gerschenkron (1962, pp. 31–51), among others, has taken issue with the universality of prerequisites for economic development, making use of historical comparisons. He rejects the idea that "major obstacles to development *must* be removed and certain things propitious to it *must* be created before industrialization can begin" (p. 31). What impresses Gerschenkron more than the uniformity of industrial development is the diversity in patterns of growth. He argues that latecomers to development are not likely to follow the sequence of their predecessors but instead can be expected to change the sequence around, to violate preconditions, and to skip certain stages entirely. After observing differences among the already developed countries in their growth processes, Gerschenkron formulated a series of specific hypotheses of the form: "the more *X* a country has, the more likely it is to do *Y*." By defining *X* and *Y* in measurable terms, many such hypotheses can be made operationally feasible. Specifically, Gerschenkron argues that the more relatively backward a country is, the more likely its subsequent development will be characterized by: (1) higher rate of growth in manufacturing; (2) greater stress on large scale in plant and firm size; (3) more emphasis on capital goods; (4) more downward pressure on consumption standards; (5) greater centralization in financial institutions and entrepreneurial guidance; and (6) a smaller role for agriculture in the development process. These hypotheses can be far more easily tested than the uniformity hypotheses, thereby constituting a happy compromise between hypotheses that emphasize uniformity and those that emphasize uniqueness.

### Attitudinal Factors and Status Withdrawal

Uniqueness hypotheses are exemplified by the hypotheses that have attributed economic development to fortuitous combinations of attitudes, which commanded considerable attention for a while. Many such hypotheses are rendered nonoperational by the extreme diffi-

culty of measuring the relevant attitudes. A few, such as McClelland's (1961) Need-for-Achievement Motivation (N-Ach),[11] have overcome this hurdle but nevertheless suffer from a basic defect that severely limits their usefulness in the scientific process of the stepwise elimination of error, in that they fail to explain how attitudes are determined. The lack of such an explanation implies that attitudes, and therefore development, must be attributed to a "unique" or random occurrence, to a nonsystematic factor.

Hagen (1962) has gone a step farther by advancing an attitudinal hypothesis in which attitudes are explained in terms of exogenous events (usually political or social) that deprive people of their accustomed status. Specifically, Hagen argued that, starting from childhood and continuing into adulthood, people search and strive for an identity and for status respect, especially from the members of their reference groups—groups whom they respect and whose esteem they value. A hierarchical, authoritarian, traditional economic system offers secure status to an individual with respect to his higher elite group. It is a system at a stable equilibrium.

The basic agent of change in the system is an historical accident that entails the withdrawal of the status that the highest elite had traditionally bestowed on the middle- or lower-level elite groups. This accident might be the accession to power of a new group by force, the derogation of valued systems, the nonacceptance of an immigrant group, and so on. The social tension that ensues leads the derogated group to deviate in its behavior from traditional patterns and to reject the traditional values of the derogating elite. This leads the derogated group to social withdrawal and in the course of a few generations to a less consistent control of children, with the result that the children of the deviant minority are freer to use their initiative and to become innovative than are other children. Thus, in a Schumpeterian finale, these entrepreneur-innovators constitute the engine of economic development, and deviance constitutes the fuel that will feed that engine in the future. This may or may

[11]For other examples of the literature on N-Ach, see LeVine (1966), Ostheimer (1967), McClelland and Winter (1969). For critics, see R. W. Brown (1965), Child and Storm (1956–1957), MacArthur (1953), and Schatz (1965).

not be so. The test of the hypothesis notwithstanding, the obvious question arises whether or not deviance is a necessary condition for developing entrepreneurship.

### Threshold Hypotheses

The idea of the threshold of economic development appears in both the stage theories and in the hypotheses emphasizing the unique event. In the takeoff, the threshold hypotheses examine that optimum moment in the life of an economy when breaking away from backwardness is relatively easier. In the uniqueness hypotheses, this moment is a result of a particular stimulus. Analytically, this stimulus may be conceived of in terms of Toynbee's relation between challenge and response. While small challenges may be dissipated, larger challenges generate, up to a point, effective responses.[12]

A number of hypotheses examine the relationship between the challenge and the response. Leibenstein (1957) advanced the "critical minimum effort thesis," which emphasized the relationship between population size and agricultural development. Rosenstein-Rodan's (1961) "big push" hypothesis focused on external economies. Nurkse (1953) emphasized balanced growth as a way of overcoming the supply and demand impediments to capital formation in poor countries. As we have already noted, Gerschenkron (1962) tied the tension between the backwardness of pre-industrialization conditions on the one hand and the benefits expected from industrialization on the other to the response which overcomes the obstacles to development and liberates the forces that make for industrial growth.

Each of these versions facilitates testing by specifying a particular development process yet suffers from the difficulty of specifying a priori what level of effort is sufficient to provoke growth, while not so excessive as to thwart it.

Hirschman (1967) provides a good example of the nature of the set of hypotheses that employ the challenge-response idea. He studied 11 well-diversified and matured projects financed by the World Bank in different parts of the world to explain their respective success or failure. His approach was to discern common themes running through the different experiences and to trace these themes to "the principal structural characteristics" of the projects.

Each project comes to the world with its own germs and antibodies: the unsuspected threats to its profitability and the unsuspected remedial action. The combination of these two constitutes the Toynbeean principle of challenge and response, which Hirschman elaborates as "the principle of the Hiding Hand." In this application, he suggests that creativity is underestimated. People do not seek challenge; instead, they plunge into new tasks because they erroneously think that the tasks are easily manageable. As a result, if the full cost of the projects and the myriad of problems that ensue in their implementation could have been foreseen, the projects would never have been undertaken. The job of the benevolent Hiding Hand is to disseminate misinformation so as to underestimate the difficulties associated with the project or to exaggerate the prospective benefits so that one is tricked into undertaking a task that otherwise one would not dare tackle.

Lest this sounds like the praise of folly, an invitation to financial disaster, and a chase of white elephants, let us point out that Hirschman qualifies his thesis by arguing that there is an optimum amount of challenge that will elicit successful response. "One has to be rather lucky to be lured by the Hiding Hand into ventures whose emergent problems and difficulties can be successfully tackled" (p. 28). Examples of too much challenge that thwarts response are the international promoters' gimmicks of "pseudoimitation" ("the project is a straightforward application of a well-known technique that is widely used in the United States") and "pseudocomprehensiveness" ("the previous techniques of handling the problem failed because they were 'piecemeal' ").

The difference between Hirschman and the more conventional challenge-response theory of action is that the challenge has to be camouflaged. Once this is done, one has to wait and see whether or not the unanticipated difficulty that subsequently arises is overcome. "If the difficulty is encountered and overcome, the benefits that accrue as a result are likely to be higher, the greater were the odds against a favorable outcome" (p. 36). The drawback to such an approach is that one can only identify a good project by wait-

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[12]The "up to a point" qualification is usually introduced to account for the possibility that an excessively strong challenge may be counterproductive.

ing to see whether or not it does unexpectedly well. Furthermore, Hirschman's pursuit of uniqueness goes so far as to negate not only the possibility of generalization but even, it seems, of simple classification. "It is now seen that the project analyst must be still more modest: he cannot even pretend to classify uniformly, for purposes of decision making, the various properties and probable lines of behavior of projects, as either advantages or drawbacks, benefits or costs, assets or liabilities" (p. 188).

Although nonoperational, Hirschman's treatment of the topic is perceptive. He does point out some interesting limitations of existing methods of cost-benefit analysis. Although that analysis is capable of dealing with projects in which indirect benefits and costs and the external effects are likely to swamp direct and internal effects, the technique is not capable of dealing with outputs of the project, which are at the same time inputs essential to the project's success and survival. Marginal analysis and linear programming methods are unable to deal with this situation (although integer programming may become applicable). Hirschman is persuasive in stating that the dynamic interrelationship and feedback between outputs and inputs of a project deserve as much notice as the static transformation of specific inputs to certain outputs. Thus, his thesis provides an excellent example of how even a nonoperational hypothesis can provide many useful insights.